Supreme Allied Commander Transformation

TIDE

Transforming towards
Information superiority
Decision superiority and
Execution superiority

NATO Service Oriented Architectures (SOA)

Best Practices

TIDE Strategies

- Create a cooperative climate between stakeholders (“the sandbox”) for horizontal and vertical integration of functional services breaking down traditional stovepipe barriers
- Assist in developing a network enabled architecture facilitating global deployment, alliance/coalition interoperability and plug & play reconfiguration
- Rapidly improve operational information system capabilities like COP and collaboration through spiral development, experimentation and technology insertion
- Improve integration of automated and human processes through capability component harmonization and cognitive science experimentation

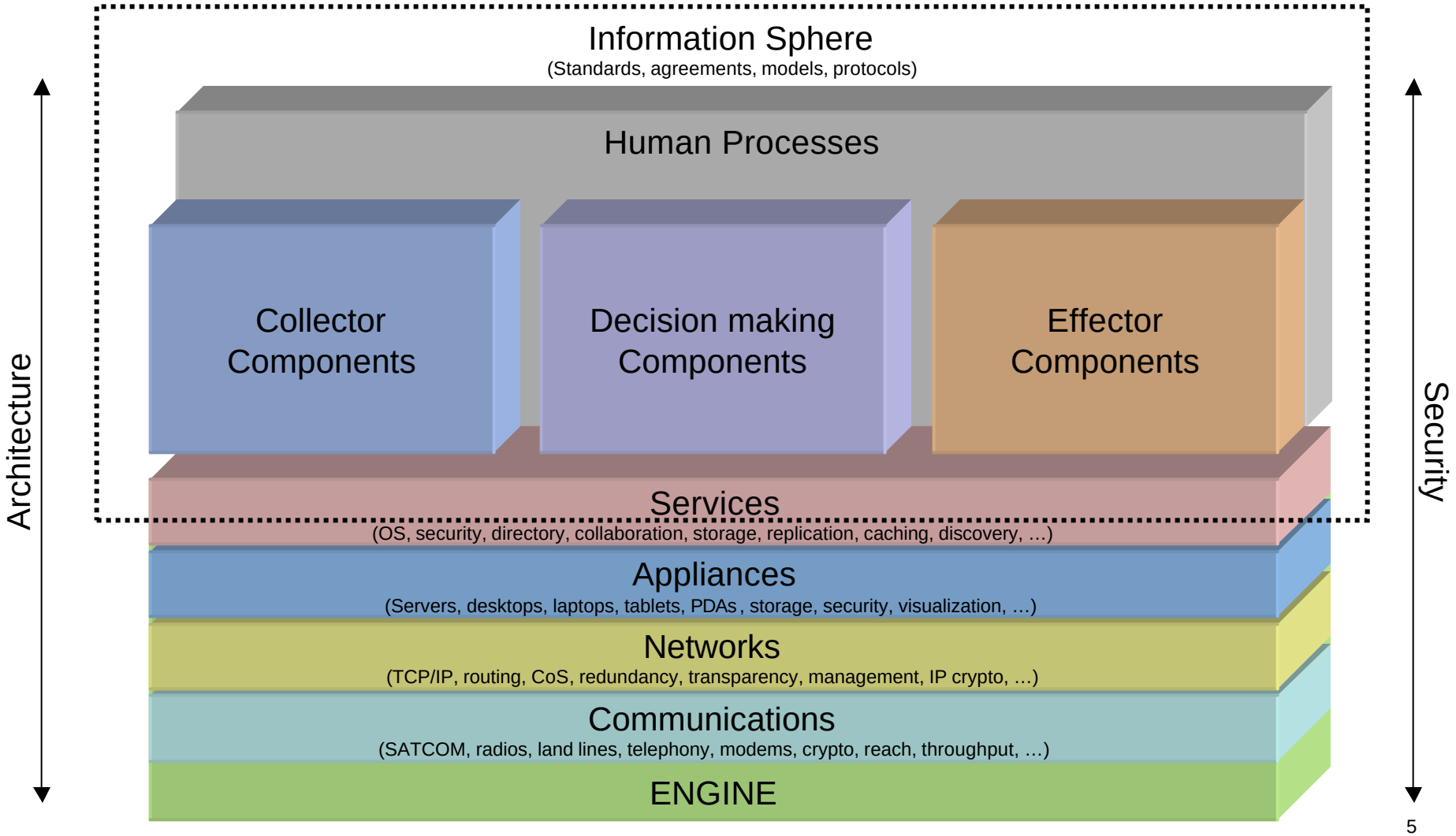
TIDE Principles (1)

- Reuse existing NATO/National systems, services and components in a network enabled environment based on best of breed integration
- Use evolutionary methodologies to fill identified gaps
- Evaluate effectiveness of proposed enhancement during experimentation opportunities and exercises

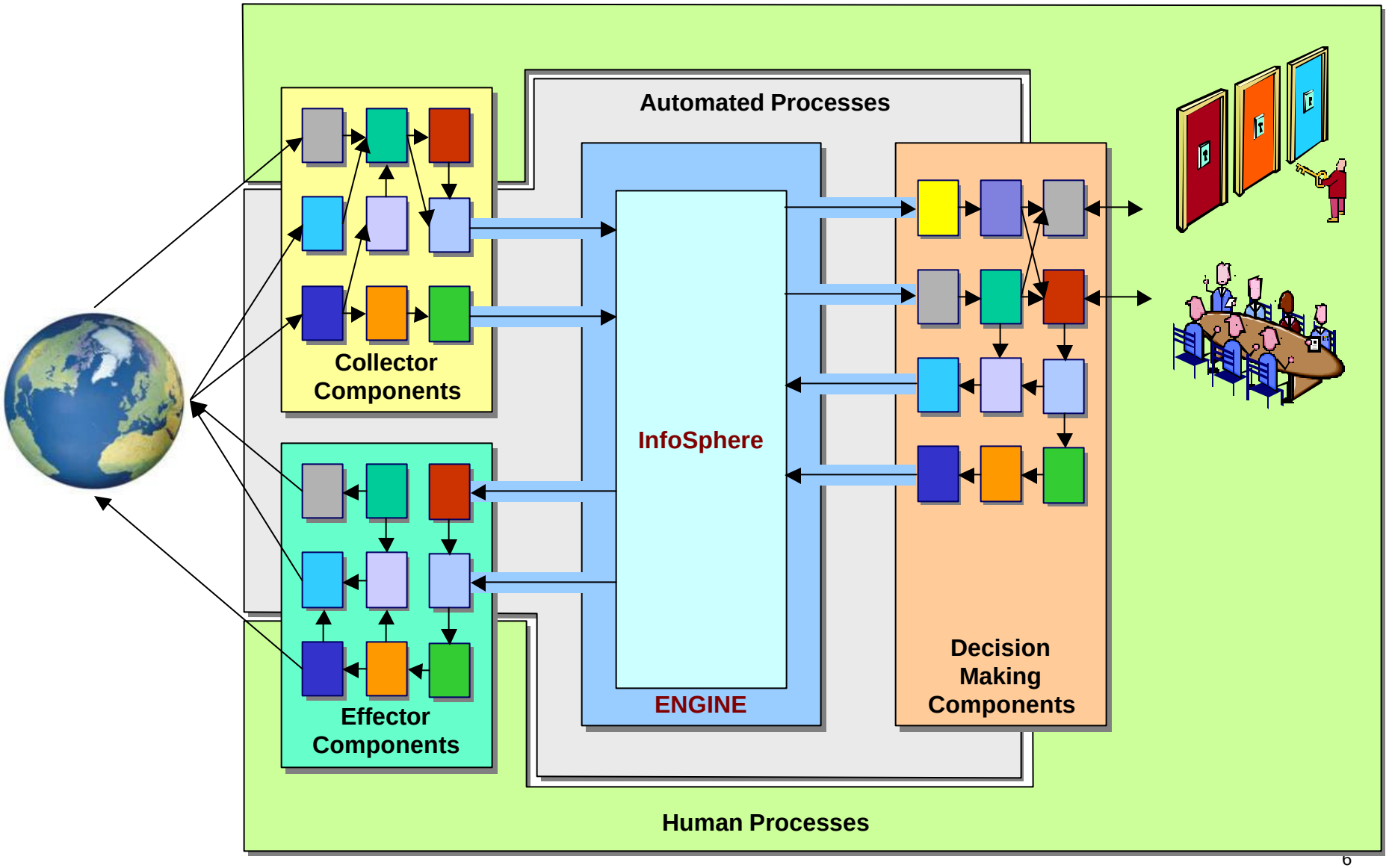
TIDE Principles (2)

- Maximize interoperability with Nations, International organizations and NGOs
- Deploy component based architecture facilitating fast reconfiguration for any environment and to counter any threat
- Evaluate automatic discovery and integration technologies promoting loose coupling between systems and components

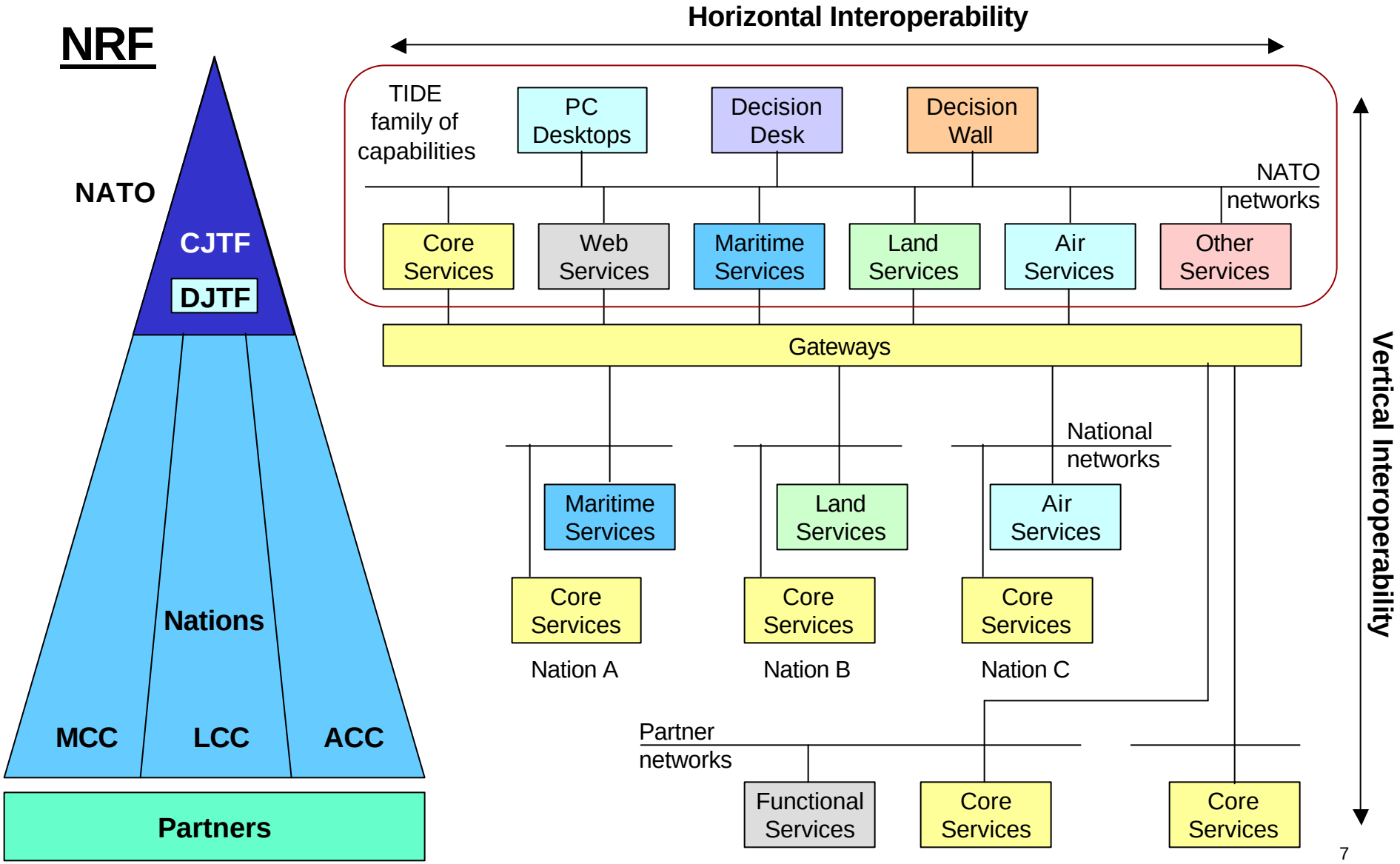
TIDE Conceptual Framework

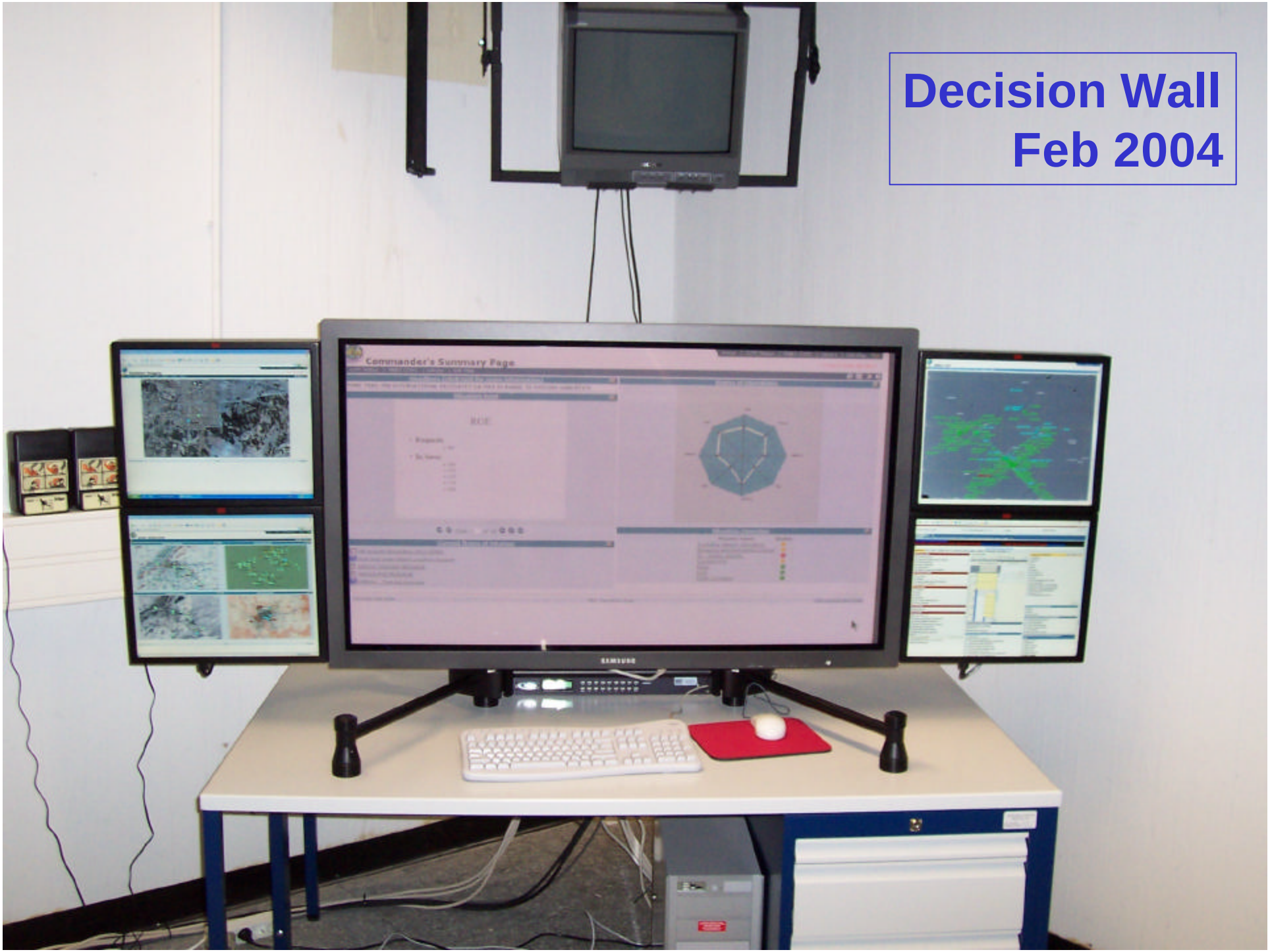


TIDE Conceptual Flow



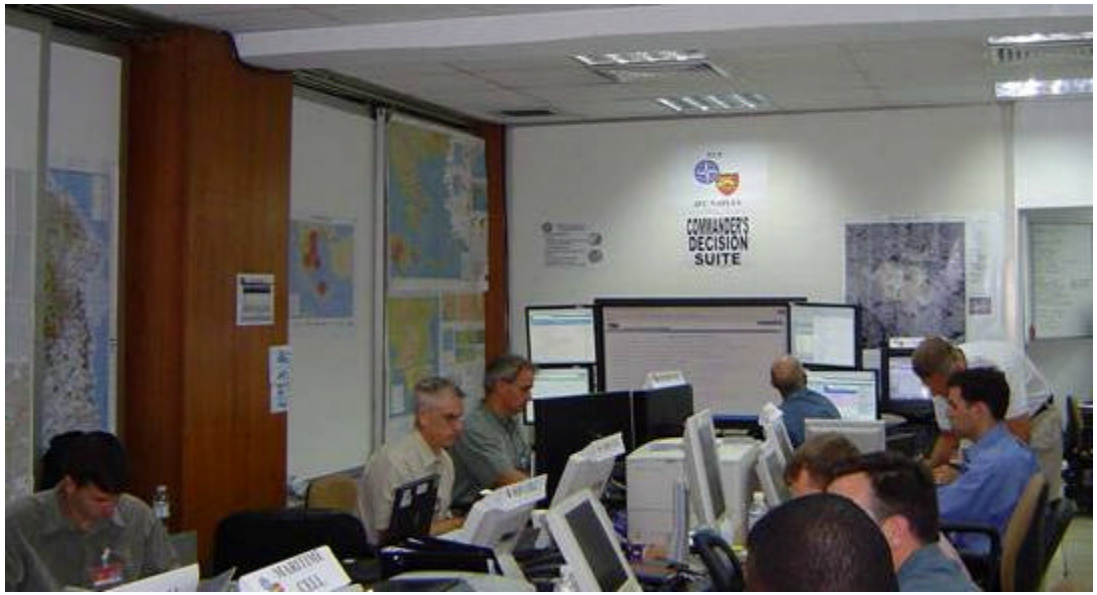
TIDE Experimentation




Decision Wall
Feb 2004
Commander's Summary Page

Allied Action 2004 - Decision Wall

Operation Distinguished Games 2004



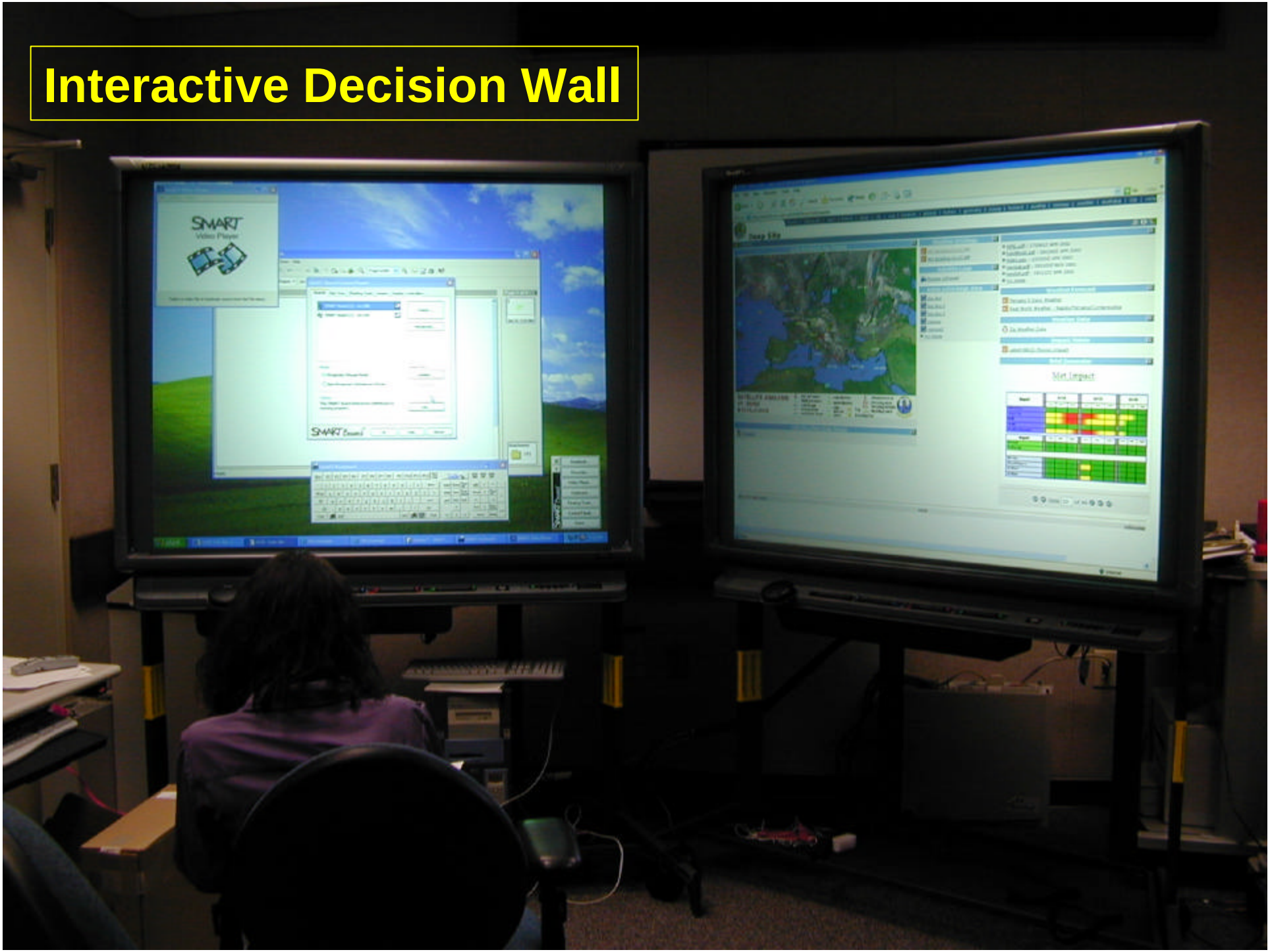
Providing…

•A land and maritime fused operational picture
•A common air picture
•A running event log
•The CJTF homepage playing latest brief in sequence

…but highly flexible, and able to

- Overlay geo and satellite images with COP data
- Pull information feeds from across the NATO network
- Be rapidly reconfigured to respond to commander's information requirements

Interactive Decision Wall



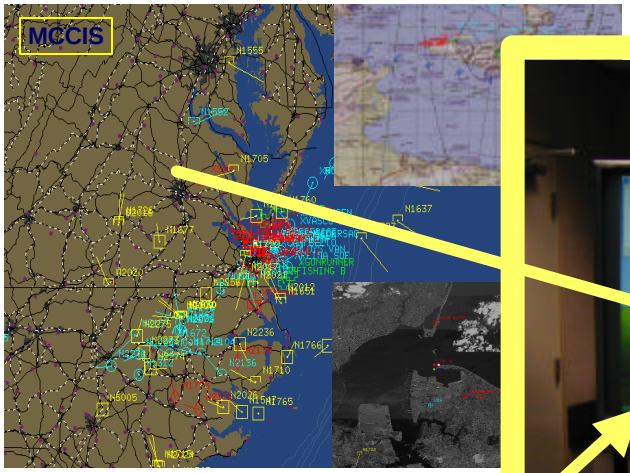
So what is transformational about the Decision Wall?

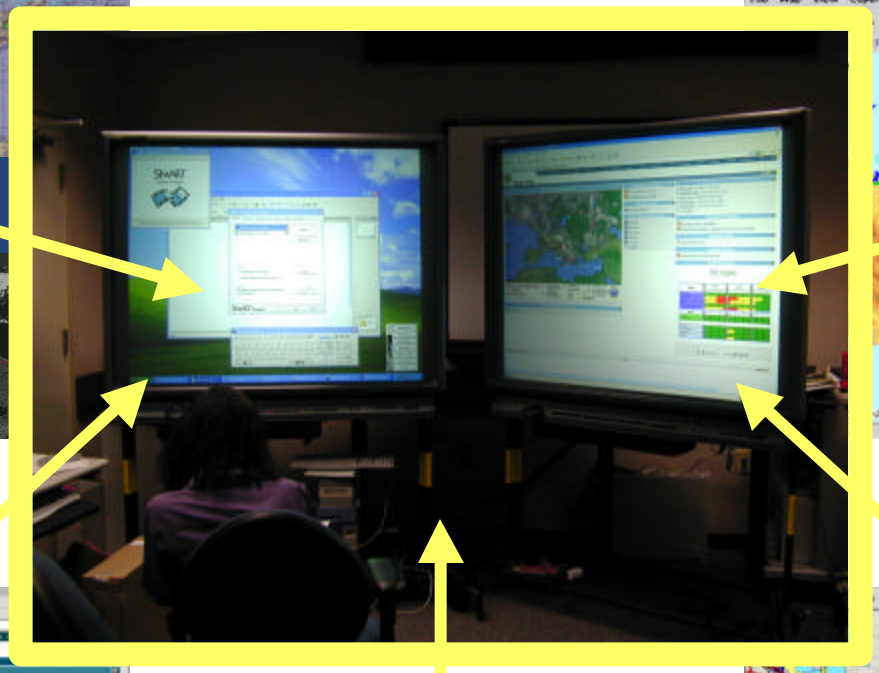
- Isn't is it just a bunch of old technologies connected to a big television?

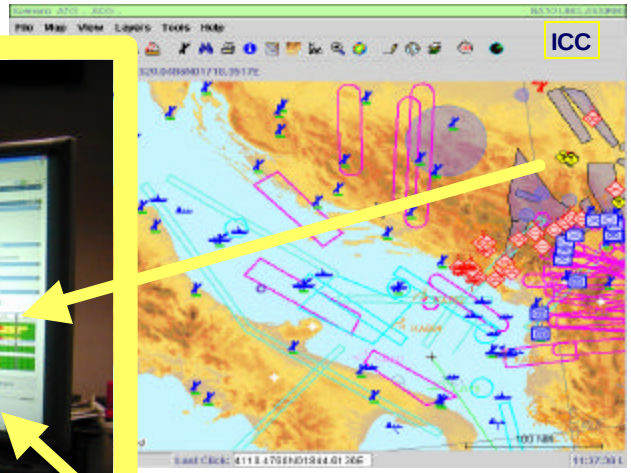
- Yes, it is!

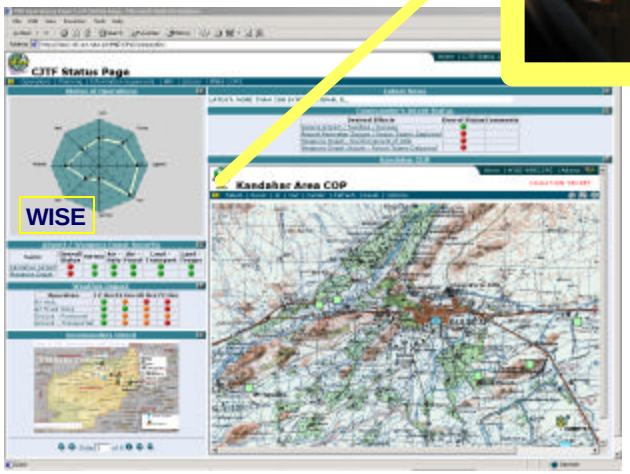
- But by connecting small but powerful components in innovative ways, a capability multiplier effect is achieved in a network enabled environment

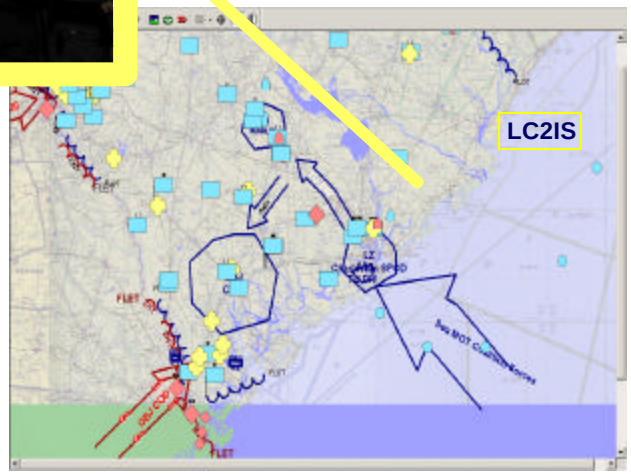
Component Based Architectures











Composable Applications

- Collector, decision maker and effector applications must be flexible, self-managing, component based services
- Lower level components must be reusable to compose other applications
- Composable applications must be based on a platform neutral, multi-tier, component architecture
- Composable applications must support automatic discovery and integration

SOA Best Practices *(ZAPThink.com)*

- Develop a top-down, extended enterprise SOA
- Build & maintain a platform independent Service model
- Maintain feedback at all points of the architecture
- Follow Agile Methodology principles & techniques within the context of the Service model
- Encapsulate existing/legacy functionality
- Embrace heterogeneity/follow a federation model of software
- Compose atomic Services into coarse-grained business Services
- Build for consumability/broad applicability
- Perform ad hoc upgrades
- Prioritize SOA transition activities on the fly

MNE Operations Page: CJTF Status Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://wise2.nrf.act.nato.int/MNE3OPs/CommandGro

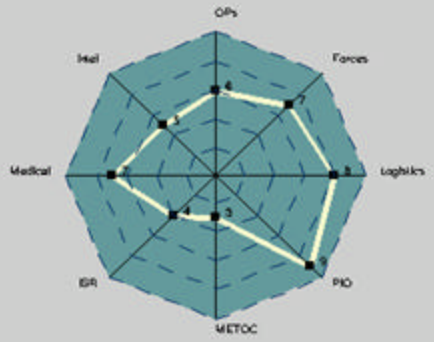
Go Links

Home | CJTF Status | MNE3 COPS | Library | Site Map

CJTF Status Page

Operations | Planning | Information Superiority | NRF | Library | MNE3 COPS

Status of Operations



Airport / Weapons Depot Security

Name	Overall Status	METOC	Air - Helo	Air - Fixed	Land - Transport	Land - Troops
Kandahar Airport						
Weapons Depot						

Weather Impact

Operation	12 Hrs	24 Hrs	48 Hrs	72 Hrs
Air Helo				
Air Fixed Wing				
Ground - Personnel				
Ground - Transportat				

Commanders Intent

Slide 3 of 8

Latest News

LATEST: MORE THAN 200 INTERNATIONAL D_

Commander's Intent Status

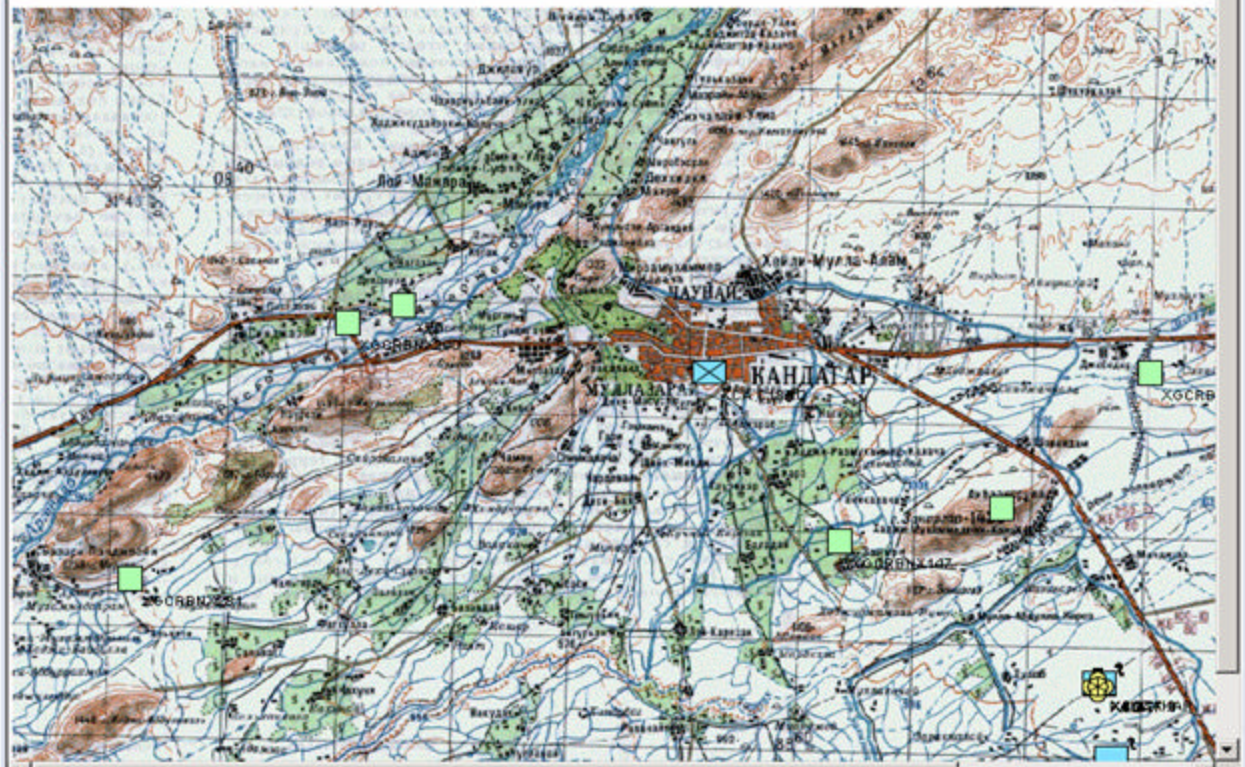
Desired Effects	Overal Status	Comments
Secure Airport / Facilities / Runway		
Airport Perimeter Secure / Recon Teams Deployed		
Weapons Depot - Reinforcement of ANA		
Weapons Depot Secure - Recon Teams Delpoyed		

Kandahar COP

Home | WISE WEBCOPS | Adams

Kandahar Area COP

Select | Zoom | In | Out | Center | Refresh | Reset | Options



Done

Internet

MNE3 WISE SITE: SJF-HQ Operational Site - Microsoft Internet Explorer

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Back Search Favorites Media

Address http://localhost/mne3/Operationa Go Links

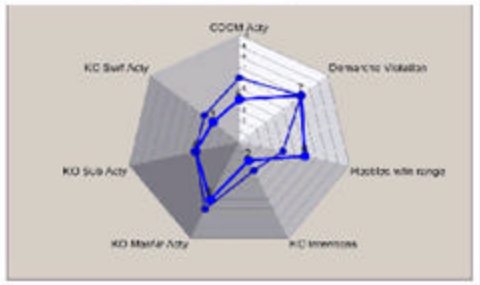
Home | SJF-HQ Operational Site | Reference |

SJF-HQ Operational Site

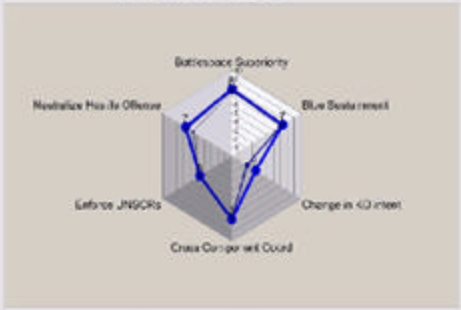
NATO UNCLASSIFIED

Intel | CTF | Metoc | Logistics | NATO Response Force | Missions | ONA | UN Reports and Resolutions

Overall Status



Counter drugs

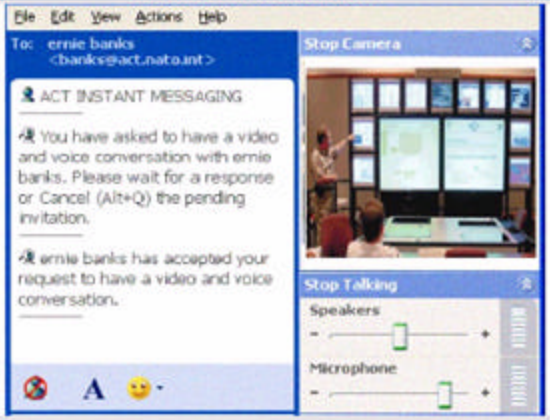


Current OPS

Operation	Mission Status	Sorties	Supplies	Troop Readiness
Red Dog				
Evade				
Ferret				
Force Protect				

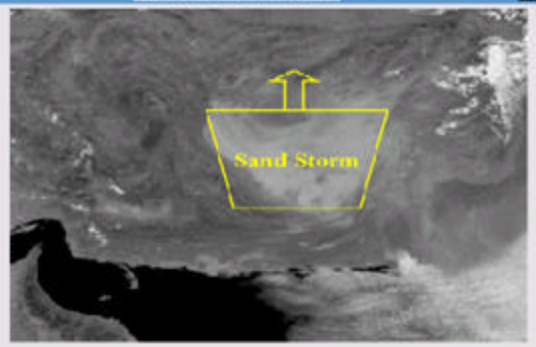
COP

Desktop Collaboration



LIVE CNN Feed

Weather Concerns

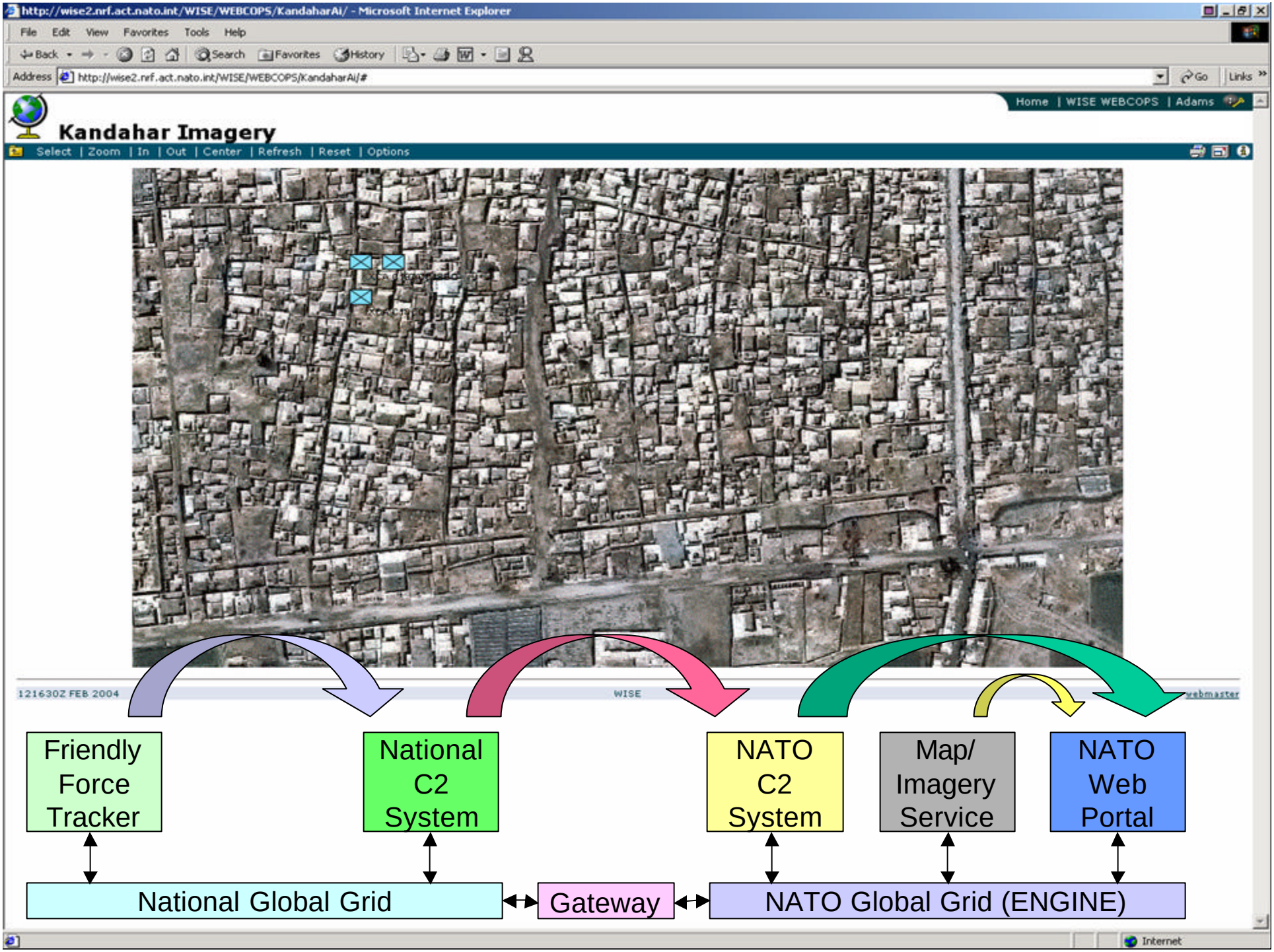


Weather Impact

Operation	12 Hrs	24 Hrs	48 Hrs	72 Hrs
Air Helo				
Air Fixed Wing				
Ground - Personnel				
Ground - Transportat				

281555Z JAN 2004 MNE3 WISE SITE Training

http://localhost/mne3/Operationa Local intranet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Home | WISE WEBCOPS | Adams
Kandahar Imagery
Select | Zoom | In | Out | Center | Refresh | Reset | Options
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WISE
webmaster
Friendly Force Tracker
National C2 System
NATO C2 System
Map/ Imagery Service
NATO Web Portal
National Global Grid
Gateway
NATO Global Grid (ENGINE)
Internet

Experimentation Purpose

- Prove/disprove transformational hypothesis during technical and operational experimentation events
- Possible outcomes:
  - Hypothesis is proven wrong ->
    - Abandon experiment and file under lessons learned
  - Hypothesis has potential but needs refinement ->
    - Refine hypothesis or solution and reschedule
  - Hypothesis is proven right ->
    - Quickly transition solution to capability managers for operational fielding

TIDE Experimentation Focus

- Scaleable mobile server clusters
- Improved human computer interfaces

- Scaleable plug & play architectures
- Automatic discovery and integration

- Simple yet effective web interfaces
- Component based functional services

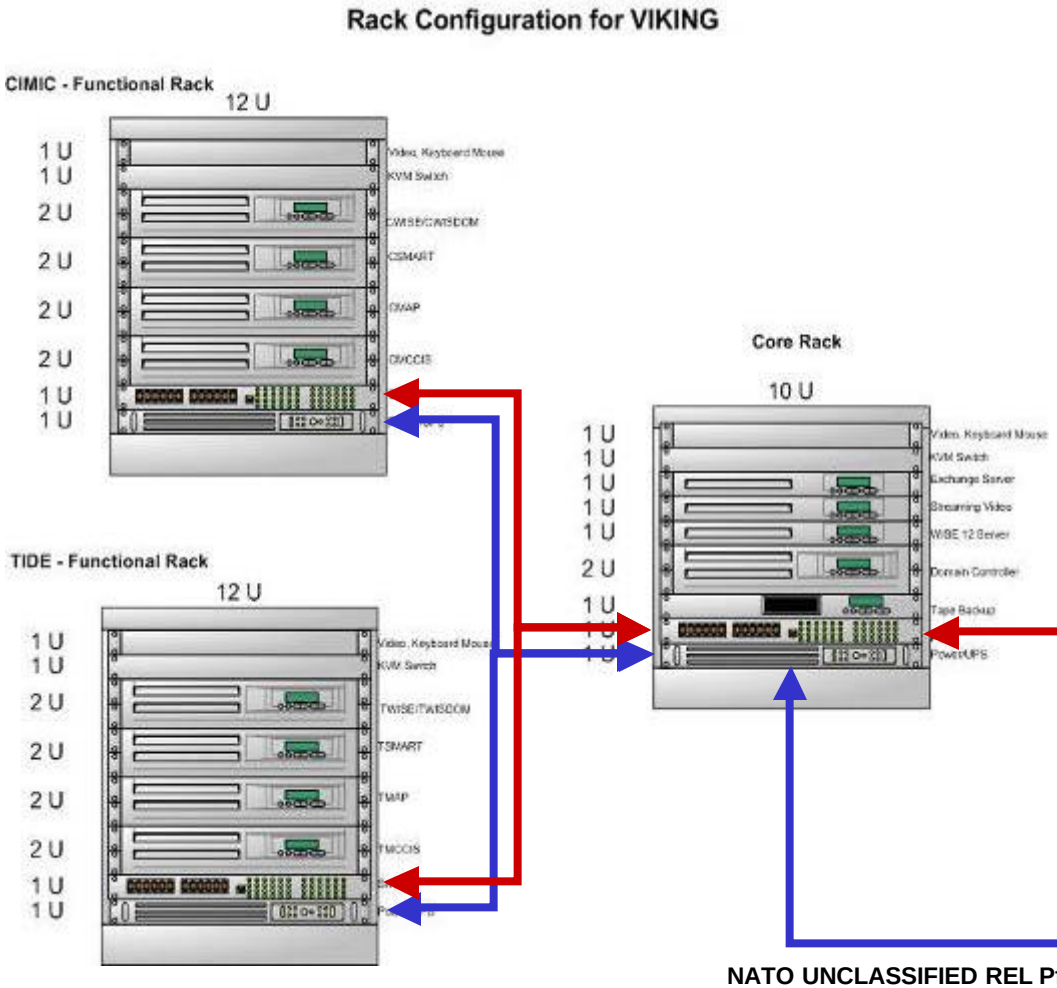
- Interoperability with partners

Hypothesis 1: Mobile IT

- To support rapid reaction forces, it is important that information technology services are highly mobile, scaleable, robust, easy to install and exhibit plug & play properties

- We can build a server cluster consisting of a number of mobile racks tied together in such a way that the requirements on the host network are limited 1 power plug, 1 network drop and a single IP address

Mobile Server Cluster Example



Hypothesis 2: Improved SA

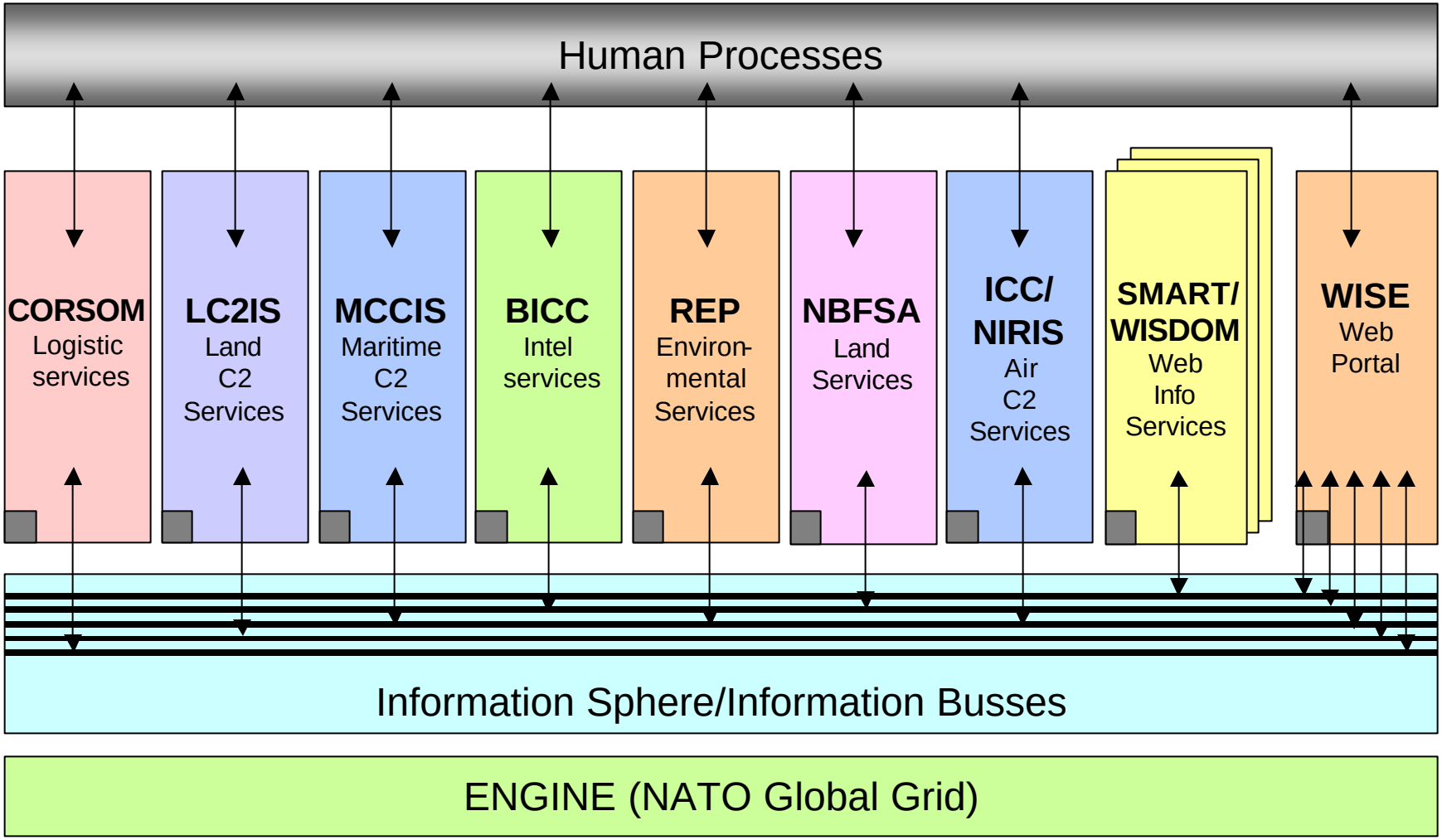
- Unambiguous joint and combined situational awareness (resulting from improved information superiority) is a key prerequisite in achieving decision superiority
- We can build a better Common Operational Picture (COP) by reusing NATO's existing capabilities in more innovative ways
- We can deploy emerging commercial standards to support automatic information discovery and semantic linking between related information

Improved SA/COP at CWID 2005

- **The Players**
  - CORSOM
    - Logistics services
  - LC2IS
    - Land C2 services
  - MCCIS
    - Maritime C2 services
  - ICC/NIRIS
    - Air C2 Services
  - BICC
    - Intel services
  - NBFSA
    - Land friendly force tracking services
  - REP
    - Environmental services
  - SMART / WISDOM
    - Information management services
  - WISE
    - Web portal Services

- **The Information**
  - Units
  - Organizations
  - Facilities
  - Events
  - Persons

Improved SA/COP at CWID 2005



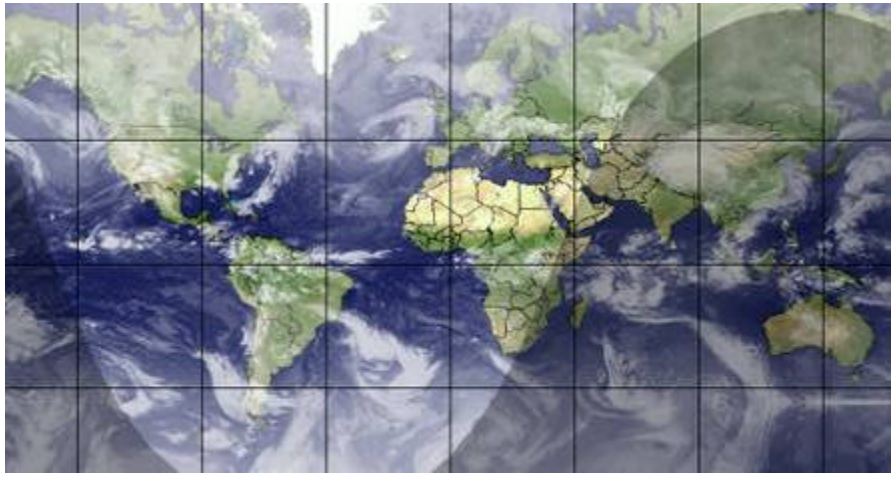
Technologies Used

- Automatic Service Discovery
  - Apple Rendezvous protocol
  - Serverless peer-to-peer discovery
  - Also known as “zeroconf” protocols
  - Open source solution available for C, C++, Java, Python, …
- Automatic Integration
  - OpenGIS consortium standards
    - Web Map Server (WMS)
    - Web Feature Server (WFS)
  - Web services (SOAP)
  - NATO experimental standard
    - Overlays with MIL-STD-252Bb or APP-6a military symbology
- Automatic information discovery and linking
  - Semantic web (RDF, Dublin Core, Taxonomies, MIP)
  - NATO experimental RDF query standard

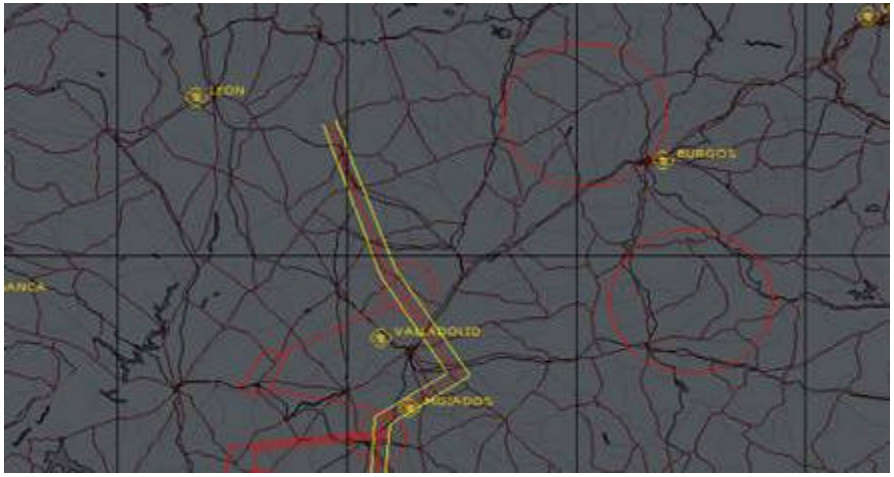
Improved SA/COP Examples

- The following set of slides show examples of improved SA and COP
- Information layers from numerous legacy and emerging capabilities are combined in a single view
- Most examples are taken from the WISE web portal but could have been taking from other systems such as MCCIS, ICC or LC2IS
- Chosen layers are only examples since information managers can automatically discover available layers and add them to their information views

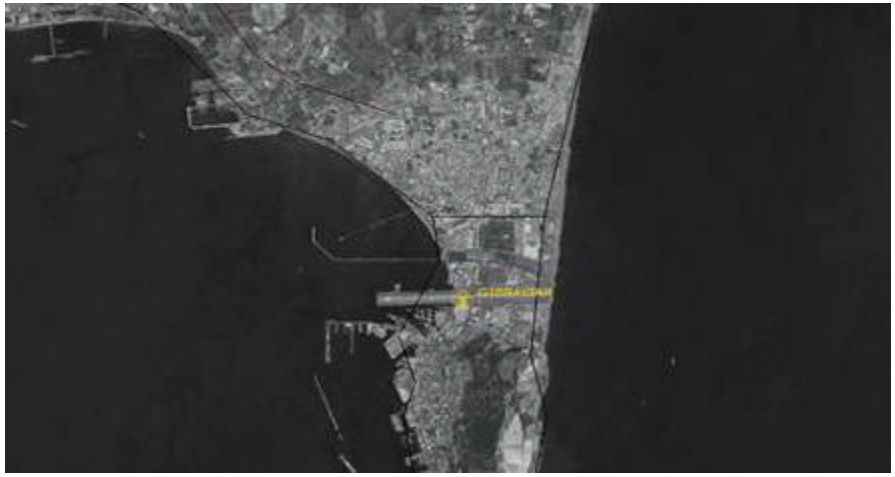
Blue Marble (NASA image from web map server) +
VMAP0 (NGA vector maps from web map server)



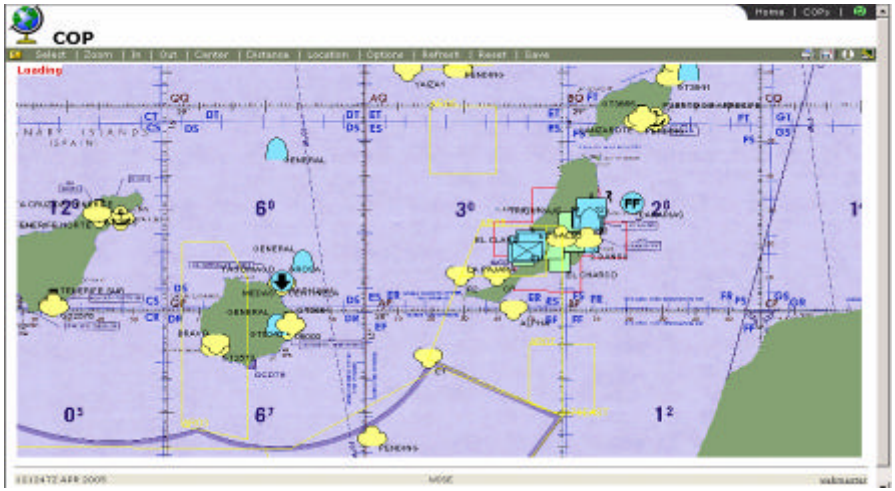
Blue Marble (NASA image from web map server) +
Global cloud layer (from web map server) +
Transparent day night layer



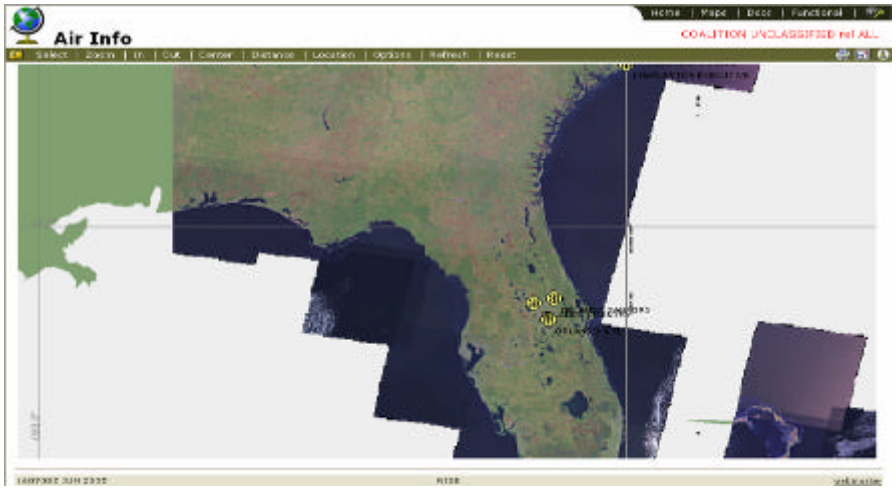
VMAP0 (from web map server) +
ACO (from ICC)



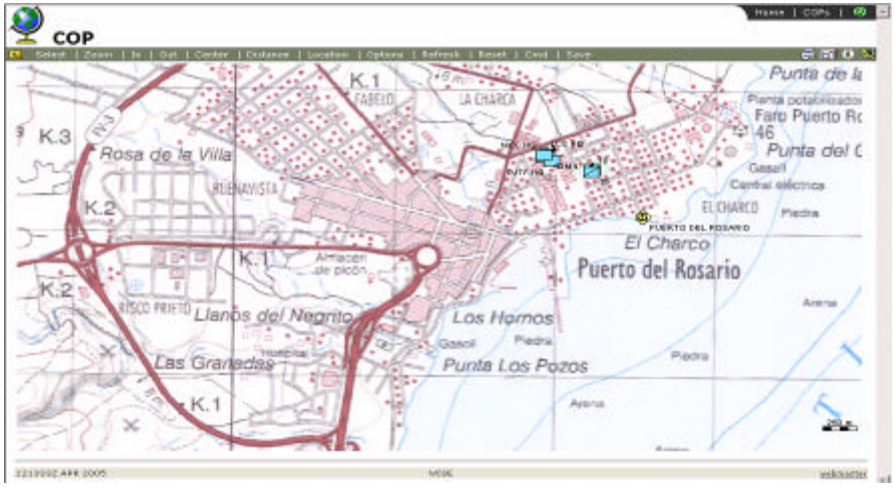
CIB (NGA imagery from web map server) +
DAFIF (airfield reference DB from MCCIS)



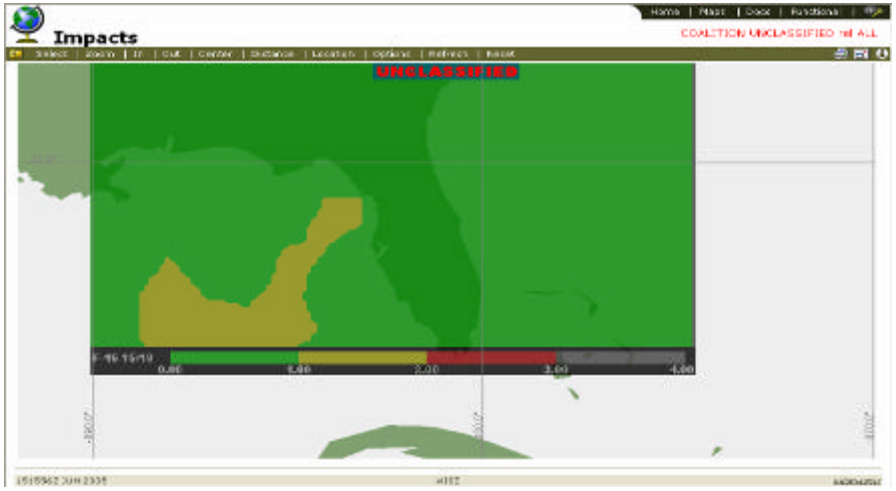
CADRG (NGA raster from web map server) + RMP (from MCCIS) + RGP (from LC2IS) + RAP (from NIRIS)



NGA vector map (from web map server) + Landsat 7 (imagery from TIDE-REP) + DAFIF (airfield reference DB from MCCIS)

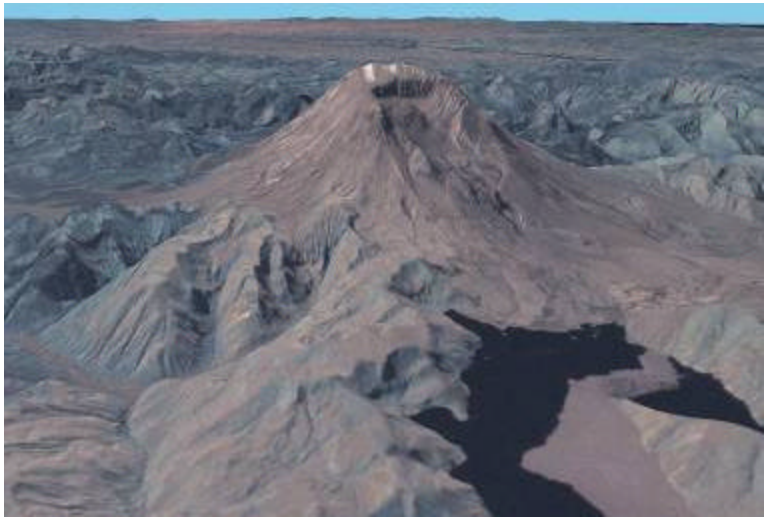


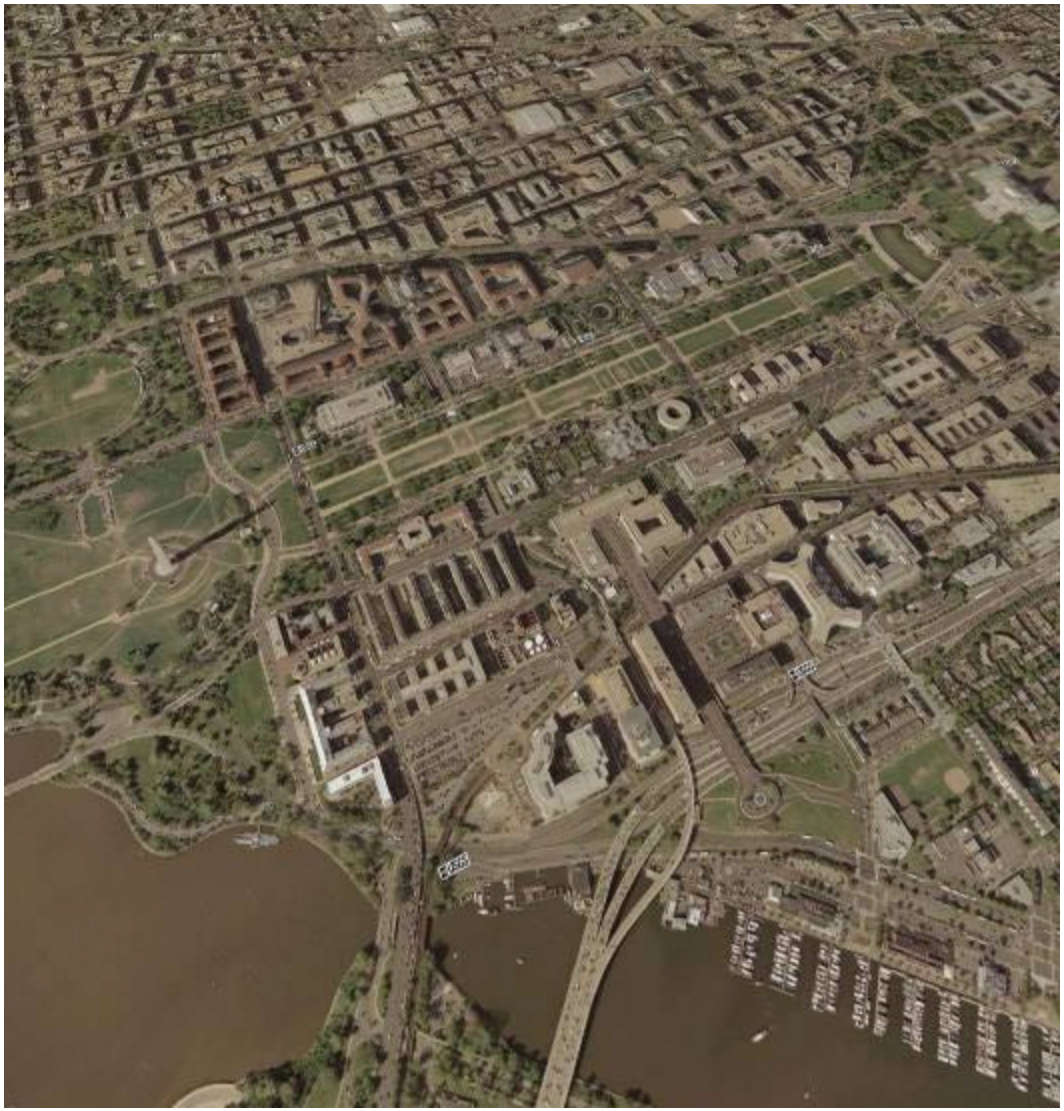
CADRG (NGA raster from web map server) + RGP (from LC2IS)



NGA vector map (from web map server) + Environmental prediction (from TIDE-REP)

Enhanced 3D Visualization



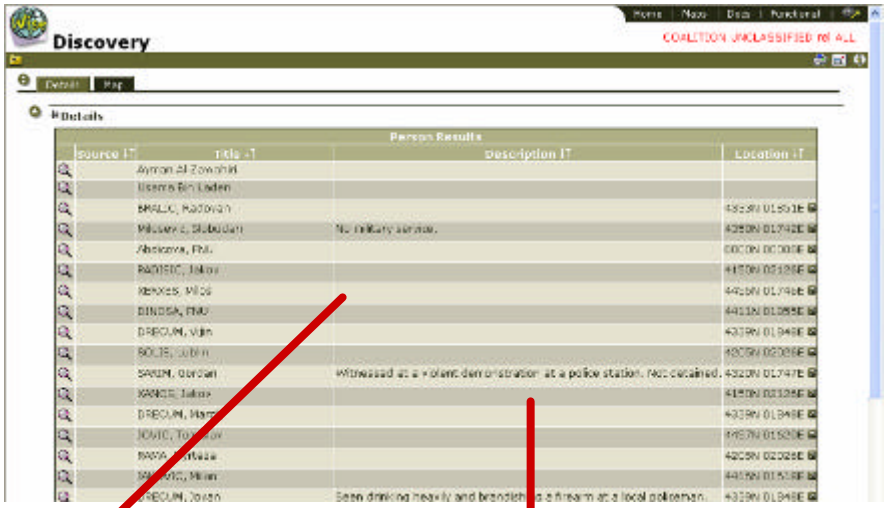


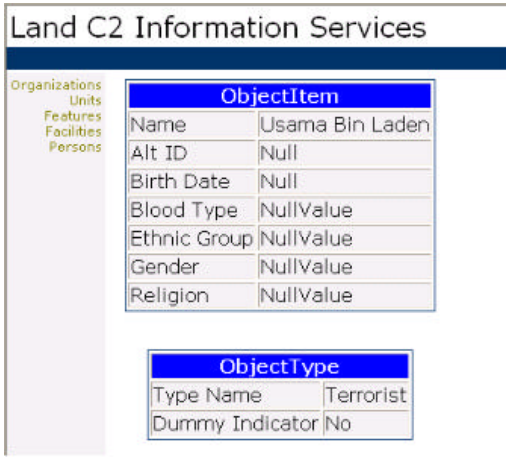
Information Discovery & Linking

- Operators will be able to automatically discover joint and combined information across many systems and domains
- Operators can link between structured (e.g. databases) and unstructured information (e.g. text documents, briefings, voice, video)
- The system automatically discovers semantic relationships between information and information sources based on information content and metadata
- Operators can also create manual relationships between information and information sources
- The next set of pages are just a few examples covering simply semantic notions. In theory, any information relationship can be discovered and explored

Information Discovery and Linking Example

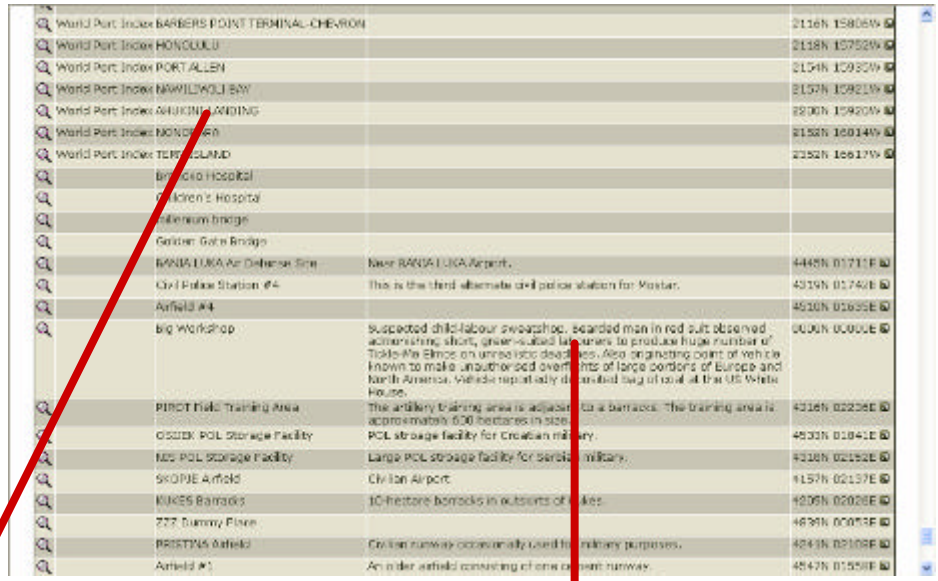
1. Using the WISE web portal, you want to discover information about persons of interest.
2. The BICC information provider knows about people and answers the WISE discovery run with a possible list of people (In this example BICC did not provide source information so as an operator you would not know where the information came from. There is room for improvement ☺).
3. Focusing on single individuals, LC2IS, BICC or others might answer the query and provides details.
4. Although the information discovery crosses many domains and sources, the operator can do it all from one screen anywhere on the network.

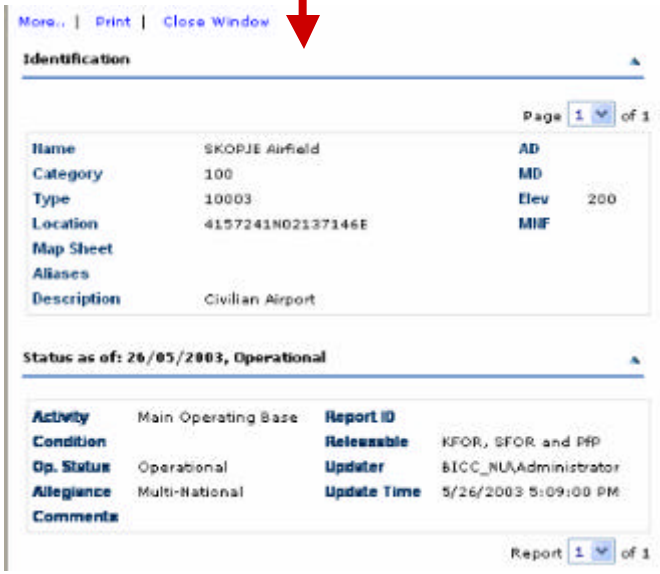




Information Discovery and Linking Example

1. You want to discover information about facilities. (This query could also have been started from any application that implements the RDF discovery protocol but in this case the examples are again from the WISE web portal).
2. A collection of information providers answer the query and since the question wasn't very specific, the answers are very diverse.
3. Operators can now drill down into the data sources like BICC and World Port Index on MCCIS.





Information Discovery and Linking Example

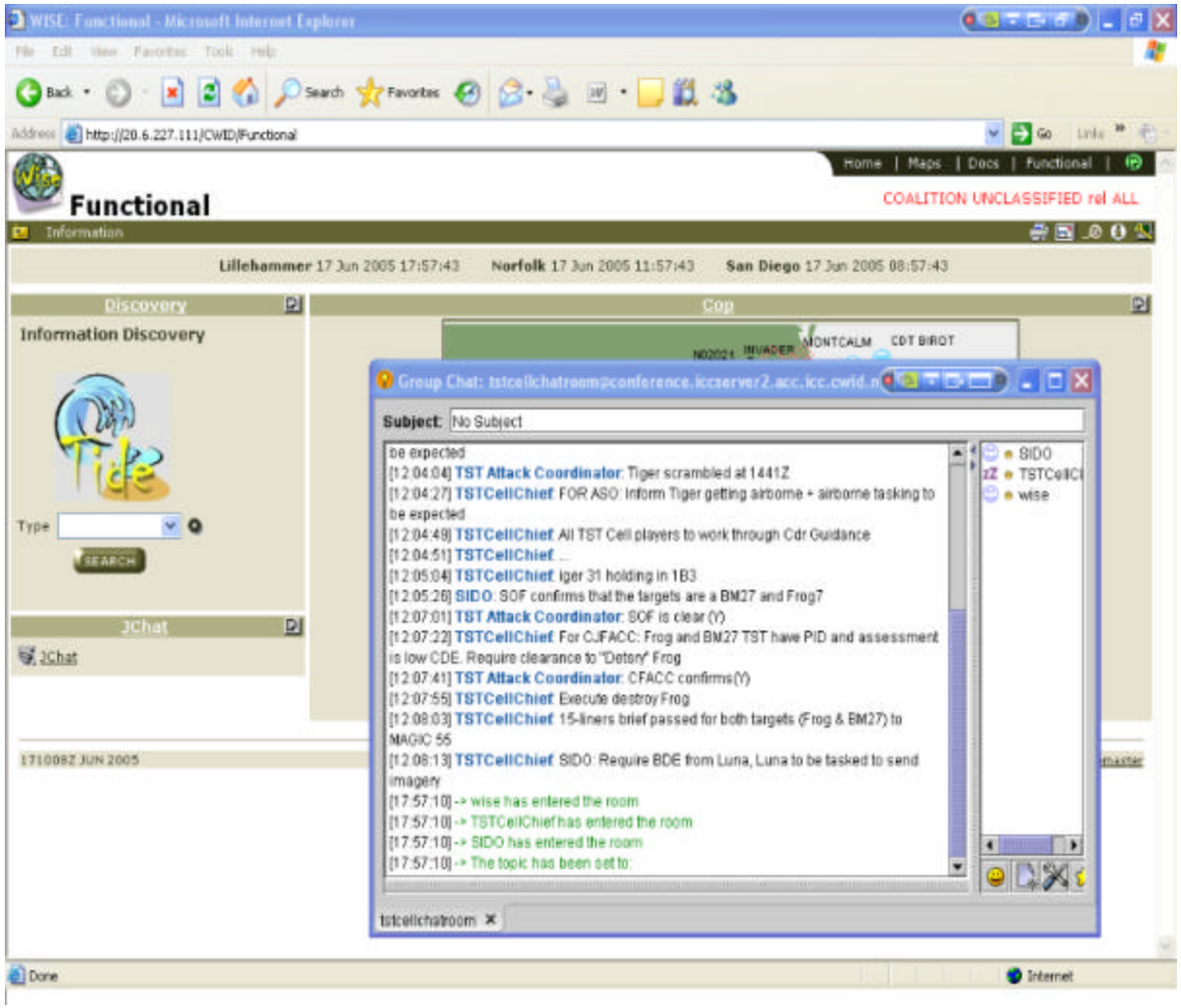
1. Once information is discovered, it is also possible to traverse related information.
2. In this example information on a port leads to information on the port's country (e.g. world fact book entry or the world wind 3D viewer).
3. It is now possible to reverse the query and discover facilities (e.g. airfields and ports in this country).

Hypothesis 3: Improved Collaboration

- For effective command & control, real-time human collaboration is essential
- For years, numerous telephony, radio and VTC capabilities have been used but cross domain computer-based collaboration such as chat, white-boarding, application sharing and desktop VTC have not matured sufficiently
- We can build computer based collaboration tools that will work seamlessly with command & control capacities to ensure that information management, information discovery and decision making can happen from the work space
- These tools should be support exchange of command & control information with the smallest amount of effort
- These tool shall support joint and combined activities across many system and domain boundaries

Real Time Collaboration

1. The COAC community is experimenting with a real-time chat capability embedded in ICC and therefore limited to ICC users.
2. In this example, the WISE web portal has been enhanced with a similar chat tool (based on the same protocol) and enables WISE users on local and remote networks to participate in the CAOC chat (assuming security requirements are met.



Hypothesis 4: Improved Visualization

- To support individual or group decision making in stressful environments, advanced visualizations are required to enable people to quickly gain mission space knowledge and understanding
- We can build solutions that improve human-to-human collaboration, information technology interaction and decision support
- These solutions must support mobile and static environments under “clean” and “harsh” conditions
- These solutions must support multi cultural, multi agency and multi security environments

Human Cognitive Experimentation

- Improve information visualization
  - What is the best way to visualize information to enable humans to gain knowledge and understanding quickly?
  - What is the best layout for certain types of information?
  - What is the right amount of information to make decisions?
- Improve capability ergonomics
  - How many clicks should it take to find the information you need?
  - What are the best human-machine-interface devices?
  - What is the best way to support information discovery and signal possible information linkages?

Touch screen technology connected to Situational Awareness and Collaboration Capabilities

Highly mobile solutions

(ATA case on wheels; remove cover, raise screen, deploy projector arm, connect to mobile IT rack and start command & control)

So what is the message?

- Forget about systems, ...
  think components and services
- Forget about large scale acquisition, …
  think (r)evolutionary spiral development
- Forget about homogeneous solutions, …
  accept heterogeneity and demand
  collaboration and cooperation with partners
- Be flexible and really think outside the box, …
  our opponents certainly are
- Don’t just focus on technology issues, …
  most of our problems are of a human nature